

**THERMOPLASTIC ELASTOMER COMPOSITION**

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**Abstract of JP 2002105341 (A)**

**PROBLEM TO BE SOLVED:** To provide an easily producible hot-melt composition capable of obtaining a low hardness product. **SOLUTION:** This thermoplastic elastomer composition comprises a crosslinked product of an organic polymer obtained by crosslinking the organic polymer (a) having a crosslinkable function group at the molecular end [(A) component] and one or more substances selected from hot-melt resins, thermoplastic resins and plasticizers [(B) component]. The composition is easily producible and can afford a low hardness elastomer.

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Reference 2

Partial Translation

JP Patent Appln. Disclosure No. P2002-105341A - 10 April 2002

JP Patent Appln. No. P2000-304390 - 4 October 2000

Applicant: Kanegafuchi Kagaku Kogyo K.K., Osaka, JP

Title: Thermoplastic elastomer composition

Claims

1. A thermoplastic elastomer composition containing a crosslinking form of an organic polymer obtained by crosslinking organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) [Component A]; and one or more selected from the group consisting of hot-melt resin, thermoplastic resin and plasticizer [Component B].

2. The thermoplastic elastomer composition according to claim 1, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are organic polymers having a hydroxyl group or a hydrolyzable group bonding to a silicon atom and at least one silicon-containing group being crosslinkable by forming a siloxane bond (a1).

3. The thermoplastic elastomer composition according to claim 1, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are organic polymers having at least one carbon-carbon double bond-containing group selected from alkenyl group and (meth)acryl group in their molecules (a2).

4. The thermoplastic elastomer composition according to claim 1, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are organic polymers having at least one hydroxyl group (a3).

5. The thermoplastic elastomer composition according to claim 1 or 3, obtained by a substantial crosslinking process whereby the organic polymer having at least one alkenyl group (a2) is crosslinked with a compound having at least one hydrosilyl group in its molecule which has a siloxane structure (c).

6. The thermoplastic elastomer composition according to any one of claims 1 to 5, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are saturated hydrocarbon polymers.

7. The thermoplastic elastomer composition according to any one of claims 1 to 6, wherein the Component (B) is a hot melt resin selected from the group consisting of SBS (styrene-butadiene-styrene block polymer), SIS (styrene-isoprene-styrene block polymer), SEBS (styrene-ethylenebutylene-styrene block polymer), SEPS (styrene-ethylenepropylene-styrene block polymer) and SIBS (styrene-isobutylene-styrene block polymer).

8. The thermoplastic elastomer composition according to any one of claims 1 to 7, wherein the Component (B) is a thermoplastic resin consisting of polyolefin resin.

9. The thermoplastic elastomer composition according to any one of claims 1 to 8, wherein the Component (B) is a hot melt resin selected from the group consisting of SEBS (styrene-ethylenebutylene-styrene block polymer), SEPS (styrene-ethylenepropylene-styrene block polymer) and SIBS (styrene-isobutylene-styrene block polymer).

10. The thermoplastic elastomer composition according to any one of claims 1 to 9, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) contain at least 80 wt % of isobutylene-derived repetition units.

11. The thermoplastic elastomer composition according to any one of claims 1 to 10, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are saturated hydrocarbon polymers with a number average molecular weight of 500 to 100,000.

12. The thermoplastic elastomer composition according to any one of claims 1 to 11, wherein the organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) are saturated hydrocarbon polymers with a molecular weight distribution (weight average molecular weight/number average molecular weight) of 1.01 to 1.50.

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Detailed description of the invention

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Method for solving the problem

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[0019] The present invention relates to a curable composition containing organic polymers having crosslinkable functional groups at the molecular terminals thereof (a) and one or more selected from hot melt resin, thermoplastic resin and plasticizer [Component (B)].

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[0041] As the present process for obtaining the crosslinked form as the Component (A) by crosslinking hydroxyl groups of the hydroxyl group-containing organic polymers (a3), a process by reacting with an isocyanate group-containing compound to form urethane bond (1); a process by reacting with a hydrosilyl group-containing compound to form alkoxy silicon bond (2); and a process by reacting with a carbonyl group-containing compound to form ester bond. In terms of reactivity, the process by reacting with an isocyanate group-containing compound to form urethane bond is preferable. Isocyanate group-containing compounds used in the present invention are not particularly limited, including aromatic isocyanate, aliphatic isocyanate and alicyclic isocyanate. In view of availability, triline diisocyanate, diphenylmethane diisocyanate, naphthalene diisocyanate, norbornane diisocyanate, hexyl diisocyanate and isophorone diisocyanate are exemplified.

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[0046] The hot melt resin as the Component (B) is not limited as

far as it complies with the objective of the present invention, and butyl rubber, partially crosslinked butyl-, polyisobutylene-, and styrene-based block polymers, EVA, olefin-, polyester-, polyamide- and reactive urethane based hot melt resins are exemplified. In view of physical property balance, styrene-based block polymers are particularly preferable. More specific examples of styrene-based block polymers, which can be used in the present invention, are SBS (styrene-butadiene-styrene block polymer), SIS (styrene-isoprene-styrene block polymer), SEBS (styrene-ethylenebutylene-styrene block polymer), SEPS (styrene-ethylenepropylene-styrene block polymer) and SIBS (styrene-isobutylene-styrene block polymer). In terms of heat resistance and weatherability, styrene-based block polymer containing saturated hydrocarbon as a rubber component is preferable, and in view of availability, SEBS (styrene-ethylenebutylene-styrene block polymer), SEPS (styrene-ethylenepropylene-styrene block polymer) and SIBS (styrene-isobutylene-styrene block polymer) are more preferable. Thermoplastic resin as the Component (B) is not particularly limited as far as it complies with the objective of the present invention, and for example, polyolefin resin, polystyrene resin, vinyl chloride resin, acryl resin and fluorine resin may be used, and in terms of physical property balance, polyolefin resin is particularly preferable. Polyolefin resins suitable for the present invention include semi-crystalline polyolefin, more closely, homopolymer type such as polypropylene and polyethylene (low density, high density and linear low density), and copolymers with vinyl acetate, acrylic acid, methyl acrylate

and ethyl acrylate. In addition, new olefin resin using single site catalyst, which was developed recently, can also be exemplified. Considering price or performance, these polyolefin resins can be used freely alone or in combination, and particularly preferable ones are HDPE and polypropylene. Plasticizer as Component (B) is not limited as far as it complies with the objective of the present invention, and the following ones may be used: polyvinyl-based oligomers including polybutene, hydrogenated polybutene, hydrogenated  $\alpha$ -olefin oligomer and atactic polypropylene; aromatic oligomers such as biphenyl and triphenyl; hydrogenated polyene oligomers such as hydrogenated liquid polybutadiene; paraffin oligomers such as paraffin oil and chlorinated paraffin; cycloparaffin oligomers such as naphthene oil; phthalic esters such as dibutyl phthalate, diheptyl phthalate, di(2-ethylhexyl)phthalate, butylbenzyl phthalate, di n-octyl phthalate, diisononylphthalate, diisodecyl phthalate and diundecyl phthalate; nonaromatic di-basic acid esters such as di(2-ethylhexyl)adipate, di n-octyl adipate, diisononyl adipate, diisodecyl adipate, di(2-ethylhexyl)sebacate and tetrahydrophthalic acid di 2-ethylhexyl; aromatic esters such as trimellitic acid tri 2-ethylhexyl and trimellitic acid triisodecyl; aliphatic esters such as butyl oleate, acetyl methyl ricinoleate and pentaerythritol ester; esters of polyalkyleneglycol such as diethyleneglycol benzoate and triethylene glycol dibenzoate; phosphates such as tricresyl phosphate and tributyl phosphate; and epoxy plasticizers such as epoxylated soy-bean oil and epoxylated linseed oil. They may be used alone or in combination of two or

more of them.

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### Example 3

100 wt parts of SEBS resin (TOUGHTEC 1031, available from Asahi Kasei) as the Component (B), 100 wt parts of isobutylene polymer having hydroxyl groups at the molecular terminals thereof, synthesized by the process disclosed in JP Patent Application Disclosure No. 2000-119330 (number average molecular weight: 5,300, molecular weight distribution: 1.5, containing hydroxyl group at about 90 % of both terminals of molecules) as the component (a3), and Mark AO-50 (available from Asahi Denka) as an antioxidant were mixed using Laboplastmill (available from Toyo Seiki Sha) at a temperature of 140 °C, the obtained mixture was crosslinked with reactive silicon-containing isobutylene polymer (component (a1)), 2 g of diphenylmethane-4,4'-diisocyanate and 0.5 g of dibutyl tin laurylate dissolved in 1 ml of toluene were added to the obtained product and kneaded for 20 minutes to form the Component (A). A moulded product made therefrom had JIS-A hardness of 60 at a temperature of 23 °C.

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